water for life

facts and information on water in alberta 2002

table of contents

water for life: an introduction 1

water in the province 3
- rivers 4
- lakes 8
- groundwater 9
- wetlands 12

aquatic ecosystems 14

surface water quality 16

water quantity 20
- droughts 20
- floods 21

climate change 22

possible solutions to water quantity issues 23

how is our water used? 26
- agriculture 28
- commercial/industrial 32
- water power developments 33
- domestic use (drinking water) 37

water management 44

water for life: an introduction

The Alberta Government is committing to a water strategy to address pressures on the province's water resources.

The strategy will ensure:

- Healthy, sustainable ecosystems (eg. watershed, rivers, streams, lakes, wetlands and groundwater)
- A safe, secure drinking water supply
- Reliable, quality water supplies for a sustainable economy
- The knowledge necessary to make effective water management decisions

Facts and Information on Water in Alberta 2002 has been developed to help educate Albertans on the province's water and some of our current challenges.

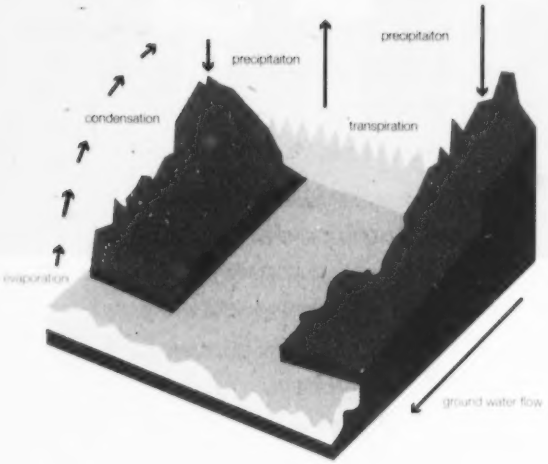
Through increased awareness and better understanding, all Albertans can help to protect and conserve our water resources.

Did you know?

Humans can only live up to four days without water.

water supports people, prosperity, and preservation

Alberta's water supplies our communities, farms, and industries with water for drinking, recreation, crops, industrial processes and the generation of electricity. Our water also supports countless life forms, both in water and on land. Responsible decision-making ensures Alberta has the water it needs to sustain the population, the economy and the environment.



Did you know?
Water is continuously being recycled as it moves from one place to another. The water molecule that might now be part of your body, could be the same molecule released from the leaves of an ancient tree or perhaps exhaled from the lungs of a dinosaur. This is called the hydrological, or water cycle.

Despite the hydrological, or water cycle's ability to replenish Alberta's water, there is still only a fixed amount available to us.

Most Albertans get their water from surface water sources, such as rivers and lakes. The runoff from rain and snow "renews" our surface water sources each year. In some years, there is more runoff, and in other years there is less. If the demand for surface water is ever higher than the supply, there will not be enough available to balance the needs of the population, the economy and the environment.

Alternatively, some Albertans and some industries use groundwater as a source of water. Groundwater is withdrawn from underground water sources called aquifers. Aquifers have rates of discharge and recharge. If groundwater is withdrawn faster than it can be recharged, the underground aquifer can not sustain itself. As a result, water levels will fall and there is a possibility that the aquifer may no longer be available as a water source.

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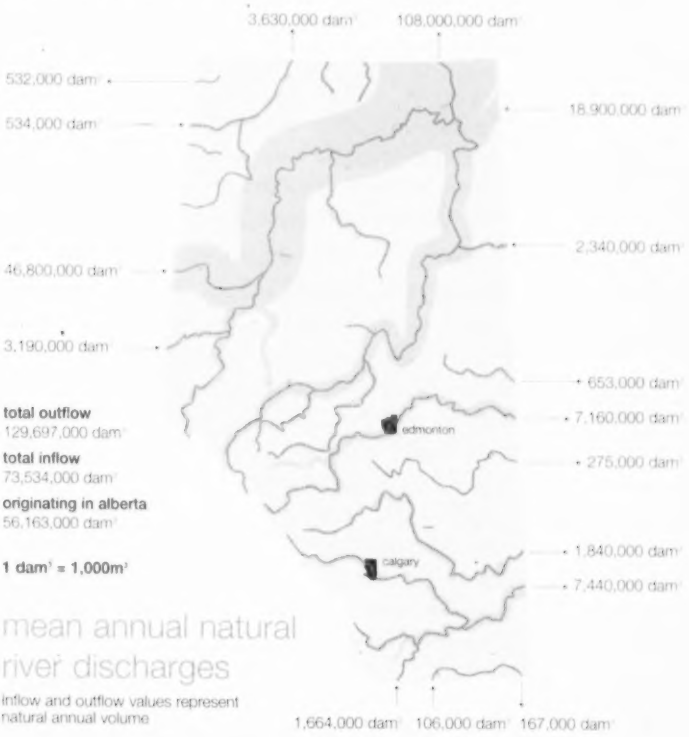
water in the province

Canada is considered to be a water-rich country, and Alberta is fortunate to have a healthy supply of fresh water. But as the population grows and we begin using water more and more, our water supply and water quality are put under increased strain.

Alberta's water can be found in rivers, lakes, wetlands and even underground. In Northern Alberta there are large flowing rivers and numerous lakes, many of which have been minimally impacted by human development. Rivers in the South have lower volumes and there are few natural lakes.

Alberta holds only 2.2 per cent of Canada's fresh water

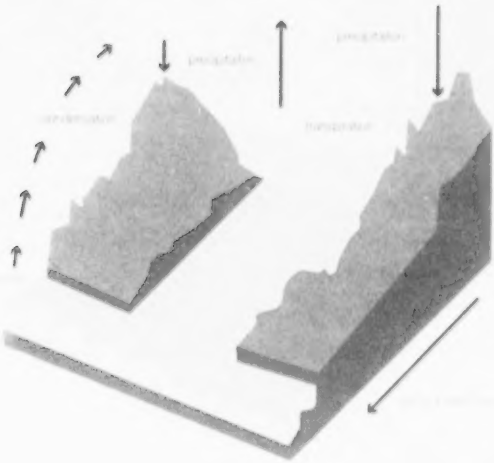
Rivers, lakes and wetlands are also known as "surface water"



mean annual natural river discharges

inflow and outflow values represent natural annual volume

Did you know?



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total outflow

total inflow

originating in alberta

1 dam³ = 1,000m³

The challenge:
River water is a resource that supports life, recreation, the economy and the environment. Demands in all these areas are growing, putting more and more strain on provincial water resources. Determining how to best meet these demands is a delicate balancing act.

What we know:
Most of the rivers in Western Canada originate from glaciers in the Rocky Mountains. As Alberta's rivers flow away from the mountains, rain and snow melt add to their flow. In Alberta, there are several major rivers that start from glaciers in Banff and Jasper. The water that melts from these glaciers supports river flows during droughts. Therefore, glaciers play a critical role after all the snow is melted and rainfall has stopped.

From the peaks of the highest mountains to your tap: Rivers from Alberta's Glaciers

- Athabasca River from the Athabasca glacier of the Columbia IceFields in Jasper National Park
- North Saskatchewan River from the Saskatchewan Glacier in Banff National Park
- Bow River originating from the Bow Glacier in Banff National Park

Alberta's major rivers and basins:
There are seven major river basins, or major river systems, in Alberta: the Peace/Slave, Athabasca, Hay, North Saskatchewan, South Saskatchewan, Beaver and Milk.

Peace/Slave River Basin: The Peace River, which begins in the mountains of British Columbia, is Alberta's largest river with the highest volume of flow. The river flows northeast across the province, through the town of Peace River, and empties into the Slave River where it eventually finds its way into the Arctic Ocean. The Peace/Slave River Basin covers a total area of 293,000 km^2 and drains more water than any other major river basin. It includes the Wapiti, Smoky, Little Smoky and Wabasca rivers. The W.A.C. Bennett Dam, a hydroelectric dam on the Peace River in British Colombia, influences the amount of water flowing into Alberta.

alberta's major rivers and basins

Athabasca River Basin: The Athabasca River originates in Alberta's Rocky Mountains. The river flows northeast through the province, past the urban centres of Jasper, Hinton, Whitecourt, Athabasca and Fort McMurray before emptying into Lake Athabasca. The basin covers a total area of approximately 159,000 km and water from the basin eventually makes its way to the Arctic Ocean. The Athabasca River Basin includes the McLeod, Pembina and Clearwater rivers. The Peace River and Athabasca River interact to form the Peace Athabasca Delta. The delta is one of the world's largest inland freshwater deltas and a wetland of international significance. It includes some of the largest undisturbed grass and sedge meadows in North America, providing habitat for large populations of waterfowl, muskrat, beaver and wood bison.

River basin: An area of land drained by a river and its associated streams or "tributaries"

Did you know?

The mean annual discharge - which is the average total volume of water flowing in the river in one year - of the Athabasca River at Fort McMurray is enough to fill up Sylvan Lake, near Red Deer, about 50 times in one year.

Hay River Basin: The Hay River Basin is located in northwest Alberta, covering about 47,900 km². The Hay River originates in British Columbia's Rocky Mountains. This water eventually makes its way to the Arctic Ocean. Sub-basins within the Hay River Basin include the Chinchaga and the Little Hay river systems. Zama Lake and Hay Lake are two lakes in the basin that are recognized for their importance to wildlife.

Beaver River Basin: The Beaver River Basin is one of the smaller basins within the province covering only 14,500 km². The basin and river extend east, into Saskatchewan, eventually emptying into the Hudson Bay. The Beaver River begins at Beaver Lake northeast of Edmonton, and then flows through the urban centres of Bonnyville, Cold Lake and Grand Centre. The basin is characterized by its many winding streams and rivers, which drain into lakes within the basin.

North Saskatchewan River Basin: The North Saskatchewan River Basin covers about 80,000 km² of the province. The basin begins in the icefields of Banff and Jasper National Parks and generally flows in an eastward direction towards the Alberta-Saskatchewan border. The Brazeau, Nordegg, Ram, Clearwater, Sturgeon and Vermillion rivers all flow into the North Saskatchewan River. The Battle River also

Despite their resilience, rivers are sensitive to pollution

Once water has been used it is never quite the same. That is why, whenever possible, water is monitored before it is released back into a river, to ensure there are only minimal concentrations of harmful substances and that they will not be threatening to the system. Examples of harmful substances include pesticides or fertilizers from

forms part of the basin and joins with the North Saskatchewan River in Saskatchewan. Major centres within the basin include Rocky Mountain House, Edmonton and Fort Saskatchewan.

South Saskatchewan River Basin: The South Saskatchewan River Basin includes the sub-basins of the Bow, Red Deer, Oldman and South Saskatchewan river systems. These basins begin in the Rocky Mountains, generally flowing eastward through foothills and prairie regions. The combined watershed of the basins is 121,095 km^2. Major urban centres in the basin include Calgary, Lethbridge, Red Deer and Medicine Hat. All of the province's 13 irrigation districts are found within the South Saskatchewan River Basin. The North and South Saskatchewan Rivers meet in the province of Saskatchewan and eventually drain into Hudson Bay.

Milk River Basin: The Milk River is the smallest of the province's major river basins encompassing an area of about 6,500 km^2. The Milk River, a northern part of the Missouri-Mississippi River Basin, enters the province from Montana, then flows eastward through southern Alberta prior to looping back to Montana. The town of Milk River is one of the few towns in the basin.

Did you know?

River levels can change within a matter of hours, particularly during spring thaw in the mountains or intense summer rainstorms.

A water delivery system for a given region, usually for agricultural purposes

our lawns and farms, chemicals from industrial sites, oil from streets in our towns and cities, and nutrients from animal and human waste. Fortunately, rivers are very resilient. The constant flow of fresh water allows them to recover from minimal impacts. But it is important we know what may be in rivers and lakes, and that we are aware of pollution's cumulative impacts, so that lasting harm is not done.

lakes

Some of Alberta's biggest lakes
Lake Athabasca
Cold Lake
Lesser Slave Lake
Lac La Biche
Peerless Lake
Pigeon Lake
Wabamun Lake

Did you know?
Alberta shares Canada's eighth largest lake, Lake Athabasca, with Saskatchewan

The challenge:
Like rivers, lake water is a resource that supports life, communities, recreation, the economy and the environment. Recently, lake levels across the province have been affected by drought conditions and in some cases, industrial uses.

What we know:
Alberta's lakes are numerous and varied. They are an important natural feature that reflect Alberta's physical settings and climate. Most lakes were formed when the glaciers retreated 10,000-12,000 years ago, leaving a number of depressions where water pooled.

Water is more abundant in the northern half of the province. In the South, and into the semi-arid southeast, however, there are few natural lakes. Where nature has not provided, reservoirs have been built to support irrigation farming, and in some cases they are used for other purposes such as recreation, sport fishing, and drinking water supply.

Water levels in lakes and rivers throughout the province fluctuate in response to local weather and overall climate. People, wildlife and aquatic ecosystems respond differently to changing water levels, but this is part of the natural hydrological cycle.

Lakes are dynamic systems in which water, light, chemicals, plants and animals interact. Sunlight is the driving force, enabling tiny plants (phytoplankton) and animals that depend on them (zooplankton) to flourish. Larger invertebrates feed on the plankton, and in turn are eaten by fish, birds and other animals. Dead plants and animals are scavenged or decompose, releasing nutrients back into the system.

Lake water quality, nutrient levels and even colour vary across the province. The map on the next page provides general descriptions of Alberta's lakes, according to where they are found.

About 800 lakes in Alberta support natural game fish populations, and another 250 to 300 are stocked regularly with game fish. Assuming all the lakes supporting game fish are equally accessible to the estimated 350,000 Alberta anglers, this would amount to a ratio of about 320 anglers per lake.

Compared to other provinces, angling use is very high on many of Alberta's lakes. To compare, Saskatchewan's 94,000 lakes, Manitoba's 110,000 lakes and Ontario's 250,000 lakes each have a ratio of only two or three anglers per lake.

For more information on fisheries management in Alberta visit www3.gov.ab.ca/srd/fw/fishing/index.html.

groundwater

The challenge:
Although we understand Alberta has large amounts of groundwater, we currently do not have complete data that indicates exactly where, and how much groundwater is available.

What we know:
Hidden beneath the earth's surface are droplets of water. They creep and trickle through the gaps between rocks or the pores between grains of sand. Until the water reaches the surface or a well is dug, we do not see this groundwater.

Groundwater is an important part of the hydrological cycle. It originates from rainfall or snowmelt that penetrates the layer of soil just below the surface. The water shares this space with air, deep in the ground. For the groundwater to be a recoverable resource, it

The boreal forest has higher precipitation and lower evaporation rates than in the grasslands and parkland. Lakes here are influenced by the vast peatlands. Acidic waters from the bogs often drain into surrounding lakes, resulting in brown-coloured waters.

Clear lakes are typical of the Canadian Shield. Water colour and quality is influenced by the hard, underlying rock.

Parkland lakes are numerous, shallow and warm. Due to surrounding fertile lands, these lakes are rich in nutrients and minerals. This can cause frequent, natural blooms of algae. Lake levels fluctuate due to their position between the moist boreal (northern) forest and the dry grasslands in the South.

Mountains weather slowly, resulting in the oligotrophic (nutrient-poor), clear lakes of the mountains and foothills.

Some lakes, especially in southeastern Alberta, are highly saline and are unable to support much life. Oliva Lake near Viking is two to three times more saline than seawater.

alberta's lakes

Parkland
Grassland
Foothills
Boreal Forest
Canadian Shield
Rocky Mountains

There are few natural lakes in the grasslands. Constructed reservoirs there are used for irrigation. These water bodies are warm, precipitation is low and evaporation is high.

must exist in an aquifer. An aquifer is an underground layer of porous rock, sand or gravel containing large amounts of water. If a formation is porous enough, a well can be drilled into the aquifer to supply water. There are different sized aquifers, some of which can support only a single home, others that can provide water for a whole town.

Groundwater can be found in practically every part of the province, but aquifer depths, yields and water quality vary.

Alberta is estimated to have much more groundwater than surface water. However, only .01 per cent of this groundwater is thought to be recoverable.

Of all the water consumed in Alberta, only about 2.5 per cent comes from groundwater. This includes Albertans who depend on groundwater for their unlicensed, domestic water wells. Currently there are approximately 500,000 domestic wells in the province and about 7,000 are added each year.

Central Alberta has a good supply of groundwater for municipal and agricultural needs. The Peace River area has less good quality, useable groundwater. Northeast of the Peace region, the quantity and quality of groundwater is marginal. Most of the groundwater used in Northern Alberta is for oil and gas operations.

In order to drill a well for groundwater, appropriate authorization may be required. A *Water Act* licence is generally required by the user to divert and use groundwater (or surface water) for non-household purposes. Otherwise, domestic, household use of groundwater does not require a licence. Drillers must also possess appropriate approvals from Alberta Environment before they can drill groundwater wells. Although Alberta Environment keeps records of wells and available groundwater, there are still many unanswered questions.

Potable water:
Water that is drinkable

Did you know?
In general, only groundwater within 400 metres of the surface is suitable for domestic consumption. Below this depth, water quality deteriorates. Whenever possible, industry is encouraged to look for alternatives to potable water, such as salt water.

Currently, the level of knowledge and understanding for groundwater is far less than that of surface water. Since groundwater is hidden below the surface, monitoring is labour-intensive and expensive. A great deal of time and work is needed before Albertans can fully understand their groundwater.

wetlands

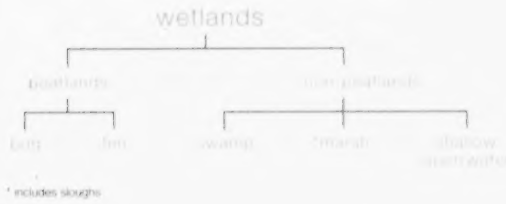
Did you know?
Close to 21 per cent of the province is covered by wetlands. Most are found in central and northern Alberta and many are permanent, holding water year-round.

The challenge:
Alberta's wetlands are under considerable pressure from land-use development. Public education, improved stewardship and careful land management is required to ensure protection of our existing wetlands.

What we know:
Wetlands are formed in depressions or low areas where the ground is saturated with water or is flooded.

There are several different types of wetlands, each with their own characteristics. Generally, wetlands are divided into peatlands and non-peatlands. Peat is the remains of partially decomposed plants such as sedges, rushes, grasses and mosses that pile up in deep layers over many years. Peat accumulates in areas known as bogs and fens. Peatlands cover approximately 93 per cent of the total wetland area in Alberta. Because peat does not accumulate to significant thickness in slough/marsh areas or in shallow water, these areas are defined as non-peatlands.

In Alberta, there are five different classes of wetlands: bogs, fens, swamps, marshes, and ponds (or shallow water).



wetlands in alberta

Darker shading indicates increased wetland cover

primarily bogs and fens

primarily permanent and semi-permanent ponds

primarily semi-permanent and temporary ponds

Importance of wetlands

Wetlands are among the most fertile and productive ecosystems on earth. Wetlands:

- *Play an important part in the hydrological cycle:* Storing surface water, recharging groundwater, or releasing groundwater.
- *Support life:* Providing food, water, shelter and space for many wildlife species. In Alberta, 250 species of birds are known to use wetlands.
- *Act as natural filters:* Filtering out sediment, absorbing nutrients, removing chemical residues. They can also be used to treat wastewater. Some scientists have called wetlands "nature's kidneys".
- *Provide economic benefits:* Peat can be sold for yards and gardens.
- *Offer recreational benefits:* Wetlands are popular for hunting, trapping and bird watching.

Wetlands today

Since settlement began in the late 1800's, wetlands have been disappearing, and many more remain at risk. The main cause is human activities such as agriculture, peat extraction, timber harvesting, oil and gas exploration and development, waste disposal, and water contamination.

As well, many of Alberta's towns and cities have grown tremendously over the years, resulting in the filling of wetlands.

Protecting wetlands

It is important to note that all wetlands are considered public lands, even if they are surrounded by private property. Because of this, it is important that landowners and land users are educated and involved in making decisions regarding wetlands to benefit both people and nature.

aquatic ecosystems

Ecosystem:
An area where living and non-living elements of the environment interact

The challenge:

Aquatic ecosystems can be susceptible to small changes in water quality and quantity. What may seem to be a very small change can have a dramatic effect on the life and the variety of plants and animals that live in or near these ecosystems.

What we know:

Aquatic ecosystems include rivers, lakes and wetlands, and the variety of plants and animals associated with them. Alberta has a wide range of aquatic ecosystems and habitats, including small streams in the mountains and foothills; large rivers extending through prairie, parkland and boreal regions; bogs, fens and peatlands in the boreal region; marshes in the parkland and prairie regions; alpine lakes; lakes and reservoirs on the prairies; and large lakes in northern Alberta.

Whether moving or still, water bodies are inhabited by many life forms. Aquatic communities, like those on land, are based on plants that use energy from sunlight to convert carbon dioxide and water into the materials of life. In aquatic systems these plants can vary from microscopic algae to large cattails.

Animals that feed on these plants are also present throughout the aquatic environment. They range from free-swimming zooplankton, to aquatic insects, to vertebrates such as fish, birds and aquatic mammals such as muskrats. These animals can, in turn, be eaten by larger ones. Lastly, scavengers and micro-organisms recycle dead plant and animal materials within the aquatic ecosystem.

Pressures on aquatic ecosystems

Life in the aquatic environment is influenced by a variety of conditions such as water temperature, light penetration, nutrients, pH (acidity or alkalinity), dissolved oxygen and chemicals, and human impacts. From mountain streams to shallow prairie lakes and wetlands, each body of water is unique.

There is no clear line that separates water and land environments

The influence of water extends beyond its banks to the bordering land. Here, a vast array of plants and animals also depend on the aquatic environment. Many animals' life cycles depend on aquatic or adjacent riparian environments. For example, toads return to water to lay eggs, and ducks require shoreline vegetation to nest.

Riparian:
The area along streams, lakes and wetlands where water and land interact

Riparian areas bordering watercourses and water bodies are very productive biologically. They support a great variety of plant and animal species, many more than drier upland areas. In addition, riparian areas filter sediment and nutrients originating from upland areas, and protect and maintain aquatic ecosystems.

Did you know?
It is estimated that 80 per cent of Alberta's wildlife use riparian areas for all or some of their life cycle requirements.

surface water quality

The challenge:
Increased demand and use is affecting Alberta's water quality. As well, we are learning more and more about natural pathogens in surface water that are difficult to treat by municipal water treatment facilities. These pathogens have the potential to cause water-borne illnesses.

What we know:
We often assume that if a stream or lake looks murky, its water is poor quality. However, in most cases this phenomenon is completely natural. Besides geography, geology, and climate, there are many factors to consider when determining water quality.

As human population increases, the impacts of industrial water use also increase. Understanding and monitoring the quality of surface water is very important. In order to do this, monitoring and testing methods focus on three categories of characteristics: chemical, physical, and biological.

Chemical	nutrients, minerals, metals, oxygen, organic compounds (e.g. oil, pesticides)
Physical	turbidity, temperature, conductivity, suspended solids
Biological	animal communities, plants and algae, bacteria, protozoans (e.g. *Giardia*)

Turbidity:
A measure of the clarity of water. Murky water is said to be "turbid"

Another very important indicator of water quality is how well it can support different types of life. Many aquatic organisms need certain conditions to live, such as high concentrations of dissolved oxygen or cool temperatures. Therefore, the number and type of aquatic invertebrates within a stream or lake can be a good indicator of the water quality in the system.

Generally, a higher dissolved oxygen level indicates better water quality.

What affects water quality? How is it managed?
Surface water quality varies naturally throughout Alberta, based on differences in local conditions such as climate and geology. Water quality is also affected by human activities.

There are three major factors that affect water quality, all of which are subject to human influence:

- *Water quantity:* The amount of water available affects its quality. The less water there is, the lower the capacity to dilute wastes. Climate change and increased consumptive demand are two issues that may affect water quantity.
- *Point sources:* These are "end-of-pipe" sources of contaminants (e.g. from industries, municipalities) known as effluents. Because these are easily identified, they are also fairly simple to monitor and to regulate.
- *Non-point sources:* These are sources of contaminants that cannot be easily traced (e.g. runoff from land adjacent to a stream). Non-point sources are of significant concern because they are extremely hard to monitor and regulate.

Each of these three factors represents an opportunity for water quality management. Water quality is ultimately the Government of Alberta's responsibility. Surface water quality data collected by Alberta Environment is stored in an extensive, computerized database. Municipal and industrial data collected by Alberta Environment are also included.

Overall, surface water is evaluated according to the purposes it serves. Alberta Surface Water Quality Guidelines have therefore been established to protect:

- Aquatic life;
- Agricultural uses (stock watering and irrigation); and
- Recreational and aesthetic purposes.

A stream must be quite healthy and rich with aquatic invertebrates to support a population of Arctic grayling. The Arctic grayling is a northern fish, which eats large amounts of aquatic invertebrates, prefers cold water, and is very sensitive to various forms of pollution.

Drinking water guidelines are not included in this list because all surface water must be treated before we consume it. Even water from the most pristine areas of the province could potentially contain naturally occurring pathogens such as *Giardia* (cause of "beaver fever")

phosphorus: friend and foe

Thirty years ago, phosphorus was big news. This chemical, a common ingredient in household laundry detergents, was identified as the culprit responsible for the excessive growth of algae and aquatic plants in lakes and rivers. Once the problem was recognized, most companies in Canada removed phosphorus (phosphate) from detergents. However, phosphorous is a naturally occurring element abundant in Alberta soils and small amounts are a necessary part of the aquatic food chain supporting algae (tiny plants) consumed by small animals.

Too much phosphorus can fuel the excessive growth of algal "blooms" and weeds. Not only is the resulting green scum an ugly nuisance, but, as the blooms die, their decomposition uses up dissolved oxygen in the water. Low levels of dissolved oxygen in water can lead to the death of fish and other aquatic animals. Some types of algae can also produce deadly toxins.

Limiting phosphorous

In Alberta, the amount of phosphorus discharged by municipalities and industries into water bodies is regulated under the Alberta *Environmental Protection and Enhancement Act*. By applying the latest technology, municipalities and industries significantly reduce the amount of phosphorus in their wastewater. Calgary, for example, has implemented a phosphorus reduction program that has greatly improved conditions in the Bow River. A similar program is being implemented in Edmonton.

what drains into our rivers?

Did you know?

In some cases, the water running into city storm drains finds its way directly in the river without being treated, potentially carrying with it the chemicals, including phosphorus, that have been applied to lawns and gardens.

tips for reducing phosphorus pollution from your home

- Compost kitchen scraps: Do not use the garburator. Keep this source of phosphorus for your garden, and out of the wastewater system.
- Protect riverbanks and shorelines: Keep soil covered with vegetation to minimize erosion.
- Fertilize in appropriate areas according to product instructions. Testing lawns and gardens prior to fertilization enables you to apply only what your soil needs.
- Do not over water: Excess fertilizer can run off and pollute nearby water bodies.
- Pick up pet wastes and dispose of properly.

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Did you know?

water quantity

The challenge:

Increased water demand associated with population and economic growth puts a strain on Alberta's water supply. Recently, water quantity has also been limited by drought conditions. Location is also an issue. Water is not always where people want it to be. In Alberta, 80 per cent of our water supply lies in the Northern part of the province while 80 per cent of the water demand comes from the Southern half of the province.

What we know:

The amount of water in Alberta is never constant. The hydrological cycle moves water throughout the province and around the world. Regional differences also create a varying amount of water throughout Alberta; much more water is in the North than in the South. The levels of water in Alberta's rivers, lakes and wetlands also varies, even to extremes. These extremes sometimes result in floods or droughts.

Droughts

Droughts occur because of a lack of precipitation in a particular region. This decreased amount of water can result in the death of vegetation and wildlife, and economic losses in industries such as agriculture. Farmers in southern Alberta are often faced with drought and rely on huge irrigation networks to get water to their crops.

During a drought, water cannot be provided to every user that demands it, especially since we must maintain sufficient levels for the aquatic environment. In these cases, priority is given to the users with the longest standing water licenses. To learn more about water licenses and water allocation, please refer to the section entitled water allocation in this book (page 46).

Floods

A flood occurs as water accumulates excessively within a body of water. This accumulation causes the water to spill over the banks of the river, lake or wetland, and on to the surrounding terrain. Floods can be caused by a high amount of rainfall, exceeding the water basin's capacity, or when something blocks the flow of a river, such as ice or logs. Depending on the size of the flood, different levels of destruction may occur; damage to vegetation; structural and economic damage; and possibly even to certain animals or people. This damage can be very costly and it can take communities years to recover.

some of alberta's big floods

Where?	**When?**	**Cost** (1999 dollar value)
Bow/Red Deer Basin	Summer 1990	$48,000,000
Oldman/South Saskatchewan Basin	Summer 1995	$88,000,000
Peace/Athabasca Basin	Spring 1997	$60,000,000

Since most communities were originally settled around rivers or lakes, many of them can be found within a flood plain. A flood plain is normally low-lying, dry land next to a body of water. If that body of water were to flood, it would first spill over the flood plain. Therefore, communities within a flood plain are at risk of some day experiencing a flood.

Sixty-six communities in Alberta have existing property development within a flood plain. A few of those communities have built structures to help protect them from flooding, such as the diversion canals in Slave Lake.

Did You Know?

The cottonwood tree species is dependent on flooding for regeneration. Common in river valleys, the seed of this tree will only sprout in flood-like conditions.

Floods and droughts:
A natural part of the ecosystem

Floods and droughts are a natural phenomenon. Fluctuations in surface water levels are natural. Some ecosystems are even dependent on these fluctuations. Floods will wash over floodplains, covering them with mineral and nutrient-rich sediment. Minor to moderate droughts are also part of normal cyclical conditions. Vegetation, wildlife and aquatic systems can adapt although the abundance and distribution of species may change.

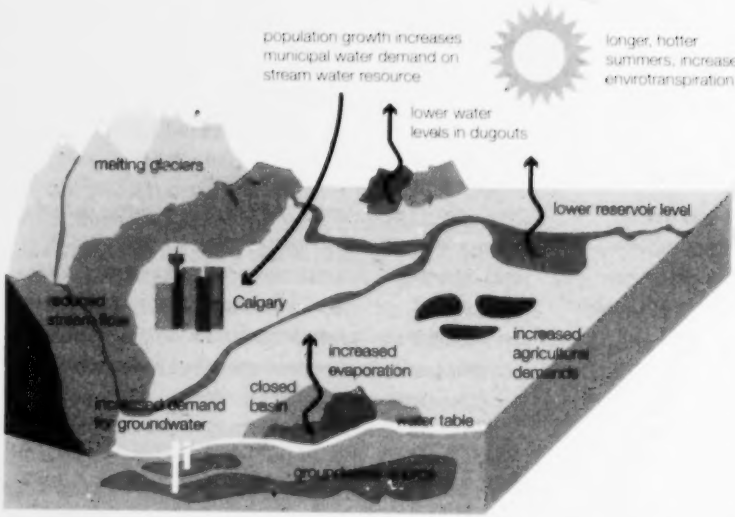
climate change

The impact of climate change on water supply is likely to become an important issue for Alberta in the future. While potential impacts are uncertain, there has been agreement that climate change will cause the hydrological cycle to become more dynamic, meaning an increase of extreme events like floods, droughts, blizzards etc. that are already part of Alberta's history.

Some of the impacts that may be seen in Alberta are:

- Decrease in snow accumulation
- Increase in evapotranspiration (moisture loss by plants)
- Changes in warm air masses resulting in changes in precipitation
- Increased glacier melt

The potential scarcity of water, especially in southern Alberta, is an ongoing issue. Climate change may make this a more pressing issue. As the climate changes, there will be a need to increase water management and conservation.



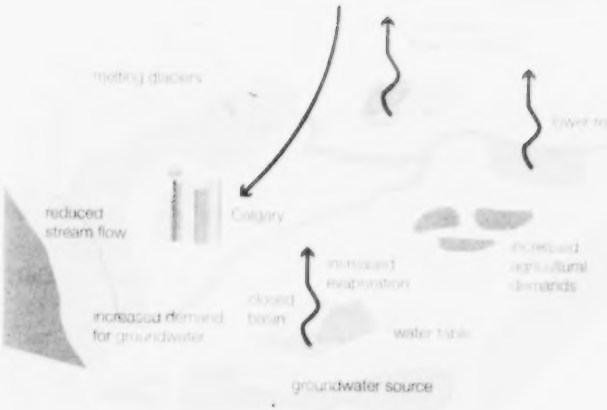
Wolfe, S.A. (Ed.) 2001. The Winds of Change: climate change in the Prairie Provinces. GSC, Miscellaneous Report 70.
http://adaptation.nrcan.gc.ca/posters

possible solutions to water quantity issues

Water conservation: We can make a difference

The water cycle continuously re-circulates the earth's fresh water supplies. The runoff from snow and rain renews Alberta's water each year. The main change we must face is the increasing population and the accompanying industrial, municipal and agricultural needs.

Locally, as well as globally, disparity in the water supply is a common theme that helps drive the need for conserving water. For most of Alberta, however, there are other reasons to conserve water that are equally important.



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Water conservation: We can make a difference

What is water conservation?

Conservation is simply the planned protection, improvement, and wise use of natural resources. It also includes controlling, protecting, and managing water.

Do we need to conserve water?

Yes. We must consider not only the growing demand for our water, but also factors such as water pollution and drought, which can affect the amount and quality available for our use. The increasing need to improve and sustain our water resources for environmental reasons is also limiting the amount of water available for other uses.

Not only do we have to think about using our existing supplies wisely; we also must consider costs. It costs money to supply, treat, dispose of and re-treat water. The energy required to meet these demands is enormous and also carries with it an environmental price tag.

Conservation outside the home

Conservation does not stop at home. Water for domestic purposes represents a very small portion of the total water consumed in the province. The majority of water is allocated to agricultural uses, such as irrigation, or industrial uses, such as oil and gas.

Before any new water is allocated for use, Alberta Environment ensures there is enough water to support aquatic ecosystems and to fulfill our apportionment agreements with Saskatchewan and Montana. The balance is allocated to users such as industries, municipalities and agricultural operations. Of all the water taken from the Bow River, only five per cent is consumed by the City of Calgary and its surrounding municipalities. Ninety-one per cent of the Bow River's water that can be allocated is consumed by irrigation. In the North Saskatchewan River, only 12 per cent is consumed by Edmonton and region, while 70 per cent is consumed for commercial or industrial purposes.

Did you know?

Studies have shown that our household water use could be reduced by 50 per cent without significantly changing our lifestyle.

Water meters: Using water meters is an effective way for municipalities to reduce water consumption. Cities that have implemented a water meter system, and who charge according to the amount of water used, are proven to consume less water than those cities that charge a flat rate for water.

Water ethic

In order to increase awareness for water conservation and responsible water use, one idea is to foster a 'water ethic' in Albertans. A water ethic involves a change in overall behavior and attitude towards water, primarily through education. Helping all users of water to realize and understand the value of water should result in more responsible use of water.

Enhancing water productivity

By generating the most efficient use of water, the overall productivity of water is enhanced. Consider how much water it takes to produce one tonne of wheat and one barrel of oil. Now consider tne same amount of water producing five tonnes of wheat and four barrels of oil. A strong water ethic, high value for water, and continued research could lead to improved water productivity.

Conserving water in your home

All Albertans should strive to economize water use.

Alberta's water paradox

In Alberta, the demand for water is not always consistent with where the supply exists. One of the most controversial ideas for addressing water shortages in dry parts of the province is to physically move water to where it is needed most.

The principle behind it is the development of a system, such as a pipeline, that allows for water to be transferred from a river basin where there is a surplus of water to areas of shortage. This could go directly into another river basin or to an end user so that the water is never mixed with rivers and lakes in the receiving basin. This idea draws charged debate, especially from those who are concerned that the natural flow of rivers is being upset and the environment and aquatic ecosystem can be harmed.

Did you know?

A dripping faucet leaking one drop per second can amount to 25 litres per day or more than 10,000 litres per year. That's enough water to:

- wash more than 65 loads of clothing,
- have 140 five minute showers, or
- wash 40 cars.

A body of water typically consists of certain biological, chemical and physical properties. Since each water source is different, mixing water from one source into another can have varying, even drastic effects to the aquatic environment. Depending on the type of interbasin diversion, you could say that directly transferring water could cause an aquatic environment to have an "allergic reaction". Tremendous costs have also caused many people to be skeptical of the merits of such a consideration. The idea of interbasin water transfers was debated quite extensively in Alberta in the 1960s and 1970s.

Interbasin transfers between major river basins are not allowed under the current *Water Act*. It would require a special Act of the Legislature before an interbasin transfer could take place. However, some believe that while it may not be the right solution to water shortages, it should at least be discussed to see if it would make any sense in the future.

The cost of water: Consumers do not pay the full cost of water. For example, people only pay for the costs of treating the water and getting it to their house – they do not pay for using the water nor do they pay for the environmental costs of withdrawing the water. This is also true for agricultural and industrial users.

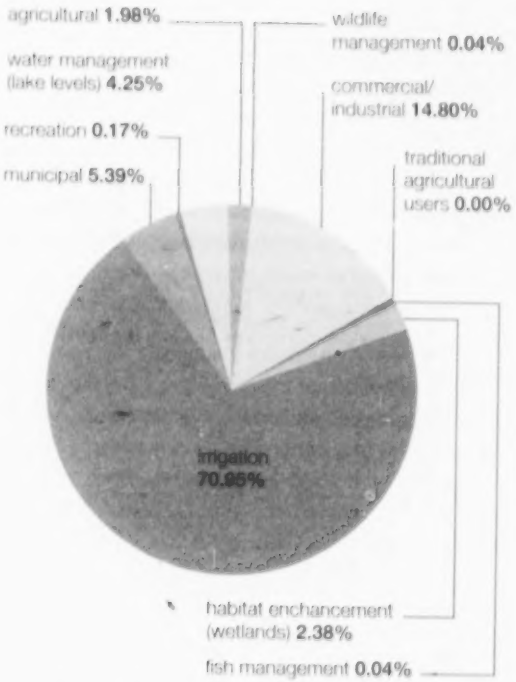
how is our water used?

Albertans use water for much more than drinking and household purposes. When manufacturing a product, water will often play different roles. It can be a part of the process where it is used for cleaning and cooling equipment. It can be part of the product such as bottled water, windshield washer fluid, or canned corn. Or, water can be part of both the process and the product. Whatever the case, water is extremely important in any industry.

Which industries are the main users of water in the province?

Of all the consumptive uses of water in Alberta, 97.5 per cent comes from surface water and 2.5 per cent comes from groundwater. The two main surface water users in Alberta are irrigation (71 per cent) and commercial/industrial operations (15 per cent). Municipalities account for five per cent of surface water consumption. The three main groundwater users are commercial/industrial (53 per cent), agricultural operations (25 per cent) and municipalities (18 per cent).

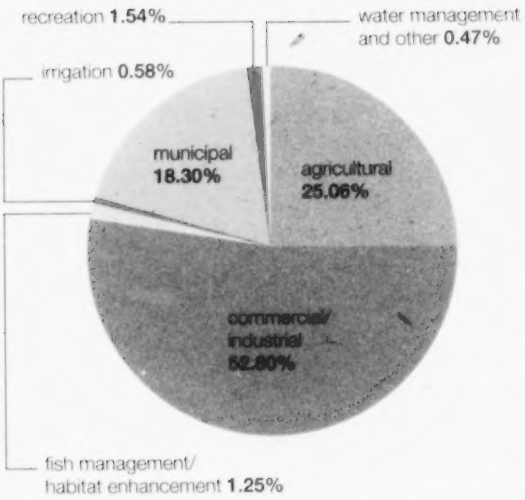
alberta's surface water consumptive uses



Consumptive use: Water taken from a source is not entirely, or directly returned to that source.

Non-consumptive use: all of the water used is directly returned to the source from which it came.

alberta's groundwater consumptive uses



Agriculture

About 30 per cent of Alberta's total land area is used for crop and livestock production. Agriculture is also considered to be one of Alberta's largest economic producers. Whether managing a large livestock operation, growing grain, or supporting a farmhouse, water is a necessary component of any agricultural operation.

Depending on their location in the province, a particular farm may depend on surface water, groundwater, or both for its operations. Most often, groundwater is used for domestic purposes, since it often requires minimal treatment before drinking and is available in most areas of the province.

Surface water may come from a nearby lake, pond, dugout, or river. This water is more often used for larger operations such as livestock, spreading of fertilizers or pesticides, or for irrigation. Depending on the purposes and amount used, a license may be required to use water for agriculture.

Irrigation

Irrigation is one of the primary methods of improving agricultural productivity and diversifying the range of crops grown in the warmer, more arid regions of the province. In southern Alberta, more than 505,000 hectares of land (four per cent of the total land that can be cultivated in Alberta) are serviced by 13 irrigation districts. These irrigation networks are used by agriculture and they also supply nearly 50 communities with water for domestic use.

Today, irrigated agricultural production accounts for about 18 to 20 per cent of Alberta's total agricultural production. Irrigation enables the growing of crops such as sugar beets and soft spring wheat, which could not survive on the amount of moisture naturally available on Alberta's dryland farms. It also greatly increases yields over what could be expected without the additional moisture.

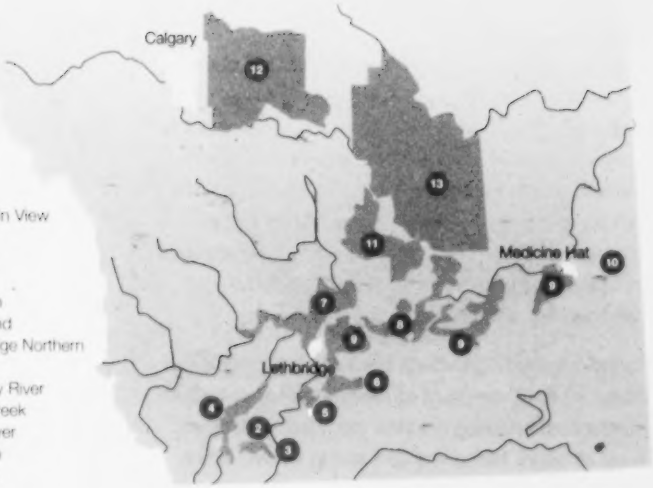
How much water does irrigation use?

Irrigation is by far the largest use of surface water in the province. It accounts for about 71 per cent of the province's consumptive use of surface water. The next largest use is commercial or industrial use at 15 per cent.

Where do the irrigation districts get their water?

All of the water used by irrigation districts comes from rivers in the South Saskatchewan River Basin, such as the Bow River, Oldman River, and South Saskatchewan River.

alberta's irrigation districts



1 Mountain View
2 Leavitt
3 Aetna
4 United
5 Magrath
6 Raymond
7 Lethbridge Northern
8 Taber
9 St. Mary River
10 Ross Creek
11 Bow River
12 Western
13 Eastern

Agriculture's effect on water quality from surface runoff

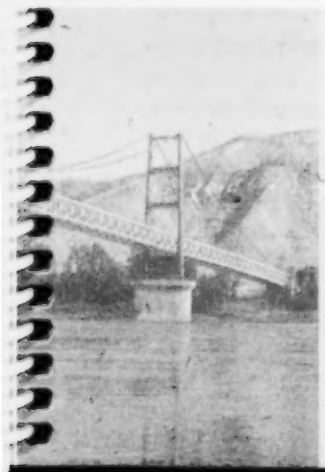
Pollution from agriculture can be a concern in some parts of Alberta, as it is in the rest of the world. In operations that are not properly managed, precipitation falls on the land and washes into the local watershed or water basin (lake or river), potentially carrying with it chemicals from fertilizers or pesticides, or fecal coliform bacteria from animal waste.

- *Nitrogen and Phosphorus:* Fertilizers contain nitrogen or phosphorus compounds that help plants grow. Waste from animals such as cows, horses, and pigs also contain high concentrations of these compounds. High levels of nitrogen and phosphorus

in surface waters are a significant environmental problem because they cause excessive aquatic plant growth. When these plants decay, they cause oxygen levels in the water to drop, sometimes stressing or killing fish and other aquatic organisms. For more information about phosphorus and the aquatic ecosystem, see pages 18 and 19.

- *Pesticides:* Chemicals from pesticides (insecticides, herbicides, etc.) are also harmful to the aquatic environment. After such chemicals are used on crops, they do not always disappear. Unfortunately, they can be washed with precipitation into local rivers or lakes. The effect of these chemicals varies, and depending on their concentration, they may kill aquatic plants, invertebrates or fish.

- *Bacterial contamination:* Bacterial contamination of surface water is widespread and comes from a variety of sources. Manure from agricultural livestock operations contains high amounts of bacteria, such as *E.Coli*, but human and wildlife waste can also contribute to the bacterial contamination of water. Therefore, all surface water should be tested and treated, or boiled, before people use it.



household fertilizers and pesticides

Fertilizers and pesticides used around homes and cottages can also affect our streams and lakes. A large household bag of fertilizer will be used on one lawn in the city, whereas a farmer may use the same amount to cover several acres of crop. Runoff from these urban yards enters rivers directly from storm sewers, untreated. Responsible use of pesticides and fertilizers in rural and urban areas is crucial to ensuring healthy aquatic ecosystems.

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Agriculture today

There are many challenges facing agriculture today. Pressures to increase yield while decreasing the impact to the environment are greater now than ever. Variations in weather and precipitation have made these goals even more difficult. Yet farmers and agricultural specialists continue to search for innovative ways to overcome problems and improve production.

Commercial/industrial uses

Alberta is a prosperous province that is home to many kinds of industries. Oil and gas, agriculture, manufacturing, the petrochemical industry and forestry are some of Alberta's top economic producers and water is vital to all of these industries.

How is water used in oil and gas, oil sands and petrochemical industries?

There are many processes involved when recovering Alberta's extensive petroleum and natural gas reserves. Water is used in many ways to recover and further process the reserves.

- The drilling rigs that are used to reach oil and gas, heavy oil or in situ oil sands use water to make a special fluid called a "mud." The mud helps to bring rock chips to the surface and to keep the drill bit cool due to the friction against the rock. The water usually comes from a surface source, but sometimes groundwater is used if there is no nearby surface water.
- In in situ oil sands areas where the oil sands are too deep to mine, water is used to make steam that is injected into the oil formation to heat it and help push it to the surface.
- In oil sands mining operations, water is used as part of the process to separate the oil from the sand. This is then sent for further processing.
- Oil sands upgraders, oil refineries and petrochemical plants use water for both heating purposes and cooling purposes.

How is water used in the forest industry?

Forestry is a big industry in the North, producing lumber and pulp for paper products. While water does not play a major role in the production of lumber, it is important in manufacturing pulp. Pulp mills use high volumes of water to help break down wood fibers, for the bleaching process, for cooling and for many other stages of their operations. There are seven pulp mills in northern Alberta, and all get their water from rivers.

Industrial wastewater

All oil and gas refineries use water to convert fossil fuels into a useable form. Much of the water can be treated and used over again, while the rest must eventually be returned to a source (river or lake). Any used water that is discharged from an identifiable location (pipe) is called effluent. Alberta Environment regulates the release of industrial wastewater to protect the environment and human health. Regulation includes minimizing the amount of wastewater released to the environment. This is mainly achieved by issuing approvals and codes of practice that limit wastewater releases from industrial activities. The department works with other government agencies, industry, and the public in developing standards, guidelines, and policies for the protection of Alberta's aquatic systems.

Water power developments and reservoirs

(Hydroelectricity)

A number of water power developments and storage reservoirs located within the province are used to generate hydroelectricity to help meet the energy demands of all Albertans.

Did you know?

Industrial and commercial activities account for about 53 per cent of all the groundwater used in the province and about 15 per cent of all the surface water.

What is a water power development?

A water power development, typically consists of three main components: a man-made dam across a river; a water storage reservoir; and a hydroelectric generation plant. During operation, the water is passed from the reservoir, through the dam via large tunnels or penstocks and through turbines located in the generation plant. The force of the water flow turns the turbines, which rotates generation units to create electricity. All of the water is released back into the river.

The amount of water passing through a water power facility is variable. It depends on the water actually available in the river or reservoir and on the amount of electricity that is required during periods of electricity demand. During peak hours, mornings (about 6 a.m. to 9 a.m.) and evenings (about 4:30 p.m. to 8 p.m.), a plant may run at full capacity. Certain generating stations may not operate overnight, when demand for electricity is very low.

There are 20 water power developments in Alberta. Eleven of these are found on the Kananaskis/Bow River system, two are found on the North Saskatchewan/Brazeau River system and seven smaller facilities are located on canals and watercourses in central and southern Alberta. The Bighorn plant produces the most electricity annually. It is found on the North Saskatchewan River system and creates enough electricity to power approximately 58,300 Alberta households.

Large Water Power Developments	Location
Barrier	Seebe – Kananaskis River
Bearspaw	Calgary – Bow River
Bighorn	Nordegg – North Saskatchewan River
Brazeau	Drayton Valley – North Saskatchewan River
Cascade	Banff National Park – Bow River
Ghost	Cochrane – Bow River
Horseshoe	Seebe – Bow River
Interlakes	Kananaskis – Kananaskis River
Kananaskis	Seebe – Bow River
Pocaterra	Kananaskis – Kananaskis River
Rundle	Canmore – Bow River
Spray	Canmore – Bow River
Three Sisters	Canmore – Bow River

How much of Alberta's electricity is produced by water power developments?

Together, Alberta's hydroelectric generating facilities are capable of producing approximately five per cent of Alberta's electricity requirements. Each development is unique and is capable of producing different amounts of electricity. These generating plants are very important for supplying electrical energy during periods of sudden demand. They can begin producing within a matter of minutes.

Who owns and operates Alberta's water power developments?

Thirteen large water power or hydroelectric generation developments are owned and operated by TransAlta Corporation. The smaller facilities are owned by other independent power producers.

Reservoir:
A constructed water body which collects and stores water for future uses

Reservoir levels and river levels

Water available for electricity generation in rivers and reservoirs is variable. Differences in season and changes in precipitation can greatly affect the water volume within the rivers and storage reservoirs. During periods of low river flow, reservoirs can release additional flow if water is available.

When the Bighorn Water Power Development was built, it created Abraham Lake, Alberta's largest constructed reservoir. Many such reservoirs are popular places for recreational activities. Albertans enjoy using these reservoir areas for boating, windsurfing, sailing, fishing and even camping. It is important to note, as with any reservoir, that because these lakes were built as part of a power project, their levels are always changing.

What is the Government of Alberta's role in approving and regulating these structures?

Alberta Environment administers the Alberta *Water Act*, which provides the authority to divert water for hydroelectric developments. The Alberta Energy and Utilities Board reviews the overall benefits of a proposed project and provides approval under Alberta's *Hydro and Electric Energy Act*.

Dams are always a controversial subject. The debate over the economic benefits versus the environmental impacts is never ending. There is no doubt that dams and reservoirs for electricity generation or other purposes drastically changes how much water flows into a river and when it will flow.

Before a dam is built, all aspects of the nearby terrestrial and aquatic ecosystems are analyzed, to assess potential and cumulative impacts. This way, Albertans can get the electricity we depend on, while minimizing environmental impacts.

Domestic use

Albertans use water every day for drinking, cooking, washing, sanitation and yard use. Although it may not seem that way, a very small percentage of the water used in this province is for domestic purposes.

Drinking water

There are two major sources of drinking water, surface water and groundwater.

Surface water comes from lakes, reservoirs and rivers. Most of Alberta's population gets water from surface water sources. Groundwater comes from either wells or springs, which are fed by underground water sources.

In Alberta, approximately two million people get their drinking water from large municipal systems. The efficiency of larger systems provide a reliable and safe supply of water at a relatively low expense, because there are so many users. Approximately 400,000 Albertans get their water from smaller water treatment plants, which is relatively costly to the operator. The remaining 600,000 Albertans obtain their water from private systems such as wells, water co-ops or by hauling.

Why does drinking water need to be treated?

The main reason for treating or disinfecting public water supplies is to kill pathogens, which are disease-causing organisms transmitted by water. Some examples of water-borne diseases and disease causing organisms are cholera, typhoid, *E.Coli*, *Giardia* and *Cryptosporidium*.

Alberta Environment regulates public waterworks systems in the province in accordance with the Alberta *Environmental Protection and Enhancement Act*. The department works closely with Alberta Health and Wellness and Regional Health Authorities to ensure Albertans on municipal water systems enjoy high-quality drinking water.

Alberta Environment issues "waterworks system" operating approvals to Alberta's municipalities. These approvals clearly outline the municipalities' responsibilities for:

- Treatment requirements
- Performance standards
- Compliance sampling
- Monitoring
- Reporting requirements

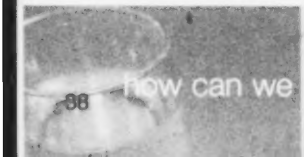
It is the law in Alberta that water from treatment facilities must also meet standards based on Health Canada's stringent "Guidelines for Canadian Drinking Water Quality".

How can we be sure Alberta's drinking water is safe?

Drinking water safety depends on a number of key elements:

- Good water supply and treatment systems
- Proper operation and maintenance of waterworks systems
- Comprehensive monitoring for drinking water quality
- Appropriate steps for correction and enforcement

Alberta Environment's drinking water program addresses all of these elements. In fact, Alberta's treatment performance standards are of the most stringent in Canada.



Alberta Environment works cooperatively with owners and operators of municipal water treatment systems to prevent drinking water problems before they occur. The department also has an active enforcement program to take action if requirements are violated.

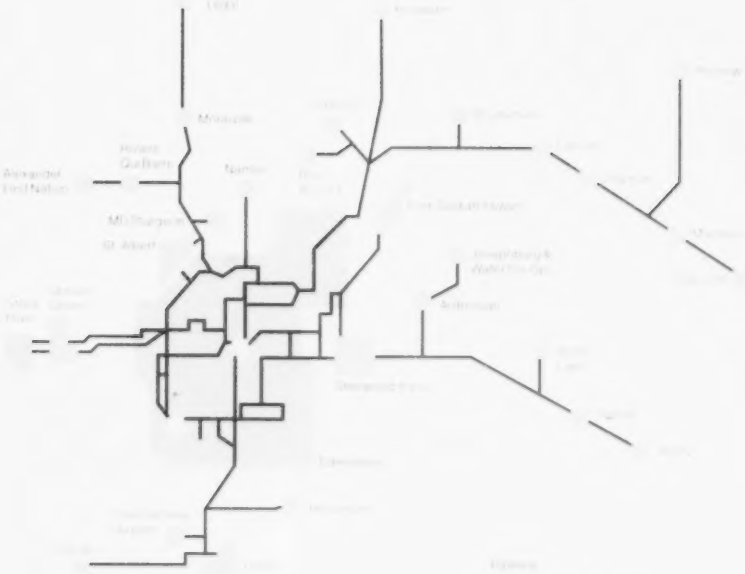
Compliance monitoring includes a minimum of one or more tests for bacteria each week. The samples are submitted to the provincial health laboratories in Edmonton and Calgary for analysis.

Alberta Environment continuously reviews new information to evaluate and, if necessary, revises drinking water requirements and standards.

In addition to Alberta Environment's comprehensive approvals and standards, a communication and action protocol ensures that the Regional Health Authorities, the public health laboratories, and the owners and operators of municipal water treatment systems can deal effectively with emergency situations, such as failed bacteriological tests. If contamination poses an immediate health threat, Regional Health Authorities will initiate boil water advisories or other interventions as deemed necessary to safeguard human health.

What if I don't get my water from a public drinking water system?

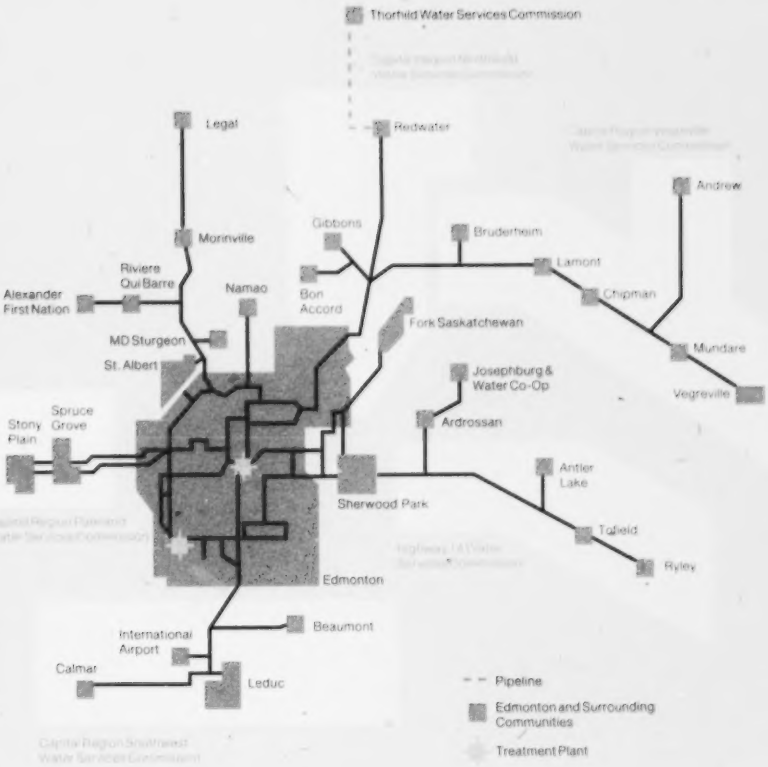
Albertans on private systems, who get their drinking water from sources such as groundwater wells, dugouts, or cisterns, are responsible for making sure their water is safe. It is their individual responsibility to have their water tested regularly and to treat it based on the water quality reports. Public health laboratories provide Albertans with bacteriological water analysis for public health purposes. Alberta Health and Wellness funds these facilities and access is provided through regional health authorities. (A handling fee may be required.) Private laboratories perform testing for routine chemistry and trace metals.



Some of Alberta's major municipalities supply drinking water to the smaller communities around them. Edmonton has the largest regional supply system in the province, providing drinking water to many rural communities, some over 100 km away.

Source: EPCOR

capital regional water supply system 2002



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Source: EPCOR

The best drinking water program in Canada

Alberta requires all approved drinking water supply systems to filter and disinfect their water before people drink it. Alberta also requires drinking water to meet health-related concentration limits for substances (like lead arsenic) that can be harmful to human health, as outlined in Health Canada's stringent Guidelines for Drinking Water Quality.

Alberta was the first province and still one of only a few that require even stricter rules for drinking water quality than those outlined in the Health Canada drinking water guidelines.

There are no double standards for systems approved by Alberta Environment. Alberta requires all waterworks systems, regardless of the size, to meet the same treatment design and performance standards, and the same guidelines for drinking water quality. This is unlike the U.S. Environmental Protection Agency, whose requirements are based on the size of the population served by a waterworks system.

Alberta has comprehensive and stringent operating, monitoring and reporting requirements.

questions about drinking water

For information on public water supplies, contact your local municipality.

Q: **Is it OK for hikers and backpackers to drink water from streams or lakes in remote areas of Alberta?**
A: No. You may have heard about water borne diseases such as "beaver fever" (giardiasis) in recent years. This disease is characterized by severe diarrhea that can last several weeks. Disease-causing bacteria from wildlife may be present in remote streams.

It is important to always boil your water if you draw it from any surface water source like a stream, lake or river. Boil the water for three minutes (use a timer) after it reaches a full boil. Do not count the time it takes for the water to reach full boiling. Water purification tablets are available at drug stores and camping supply stores, but they are less reliable than boiling.

Q: **What's the difference between hard water and soft water? Is one safer to drink than the other?**
A: The hardness of water relates to the amount of calcium, magnesium and sometimes iron in the water. The more minerals present, the harder the water. Soft water may contain sodium and other minerals or chemicals; however, it contains very little calcium, magnesium or iron. Very soft water may not be as palatable as water that contains some hardness, but you can drink either soft or hard water. The most acceptable water is moderately soft or slightly hard.

Q: **Is it okay to use hot water for cooking?**
A: No, use cold water. Hot water is more likely to contain mineral deposits that may have accumulated in the water heater.

For information on how to have water from private systems tested, contact your local regional health authority. A map of regional health authorities is available on the Alberta Health and Wellness web page at http://www.health.gov.ab.ca/index.html

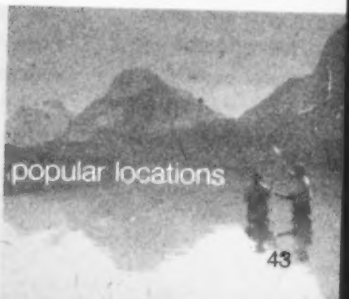
Recreation

Many Albertans use water for recreational purposes. Most recreational activities are considered a non-consumptive use of water, in that the water is not removed from the source.

With pleasant sunny summers, lakes are popular locations for swimming, waterskiing, sailing, and fishing. Northern Alberta holds most of the province's lakes, while southern Alberta has lakes that are actually constructed reservoirs. These reservoirs are also very popular for recreation, however, their levels will vary as the water is released.

Fishing is also very popular in Alberta, especially on the lakes, streams and rivers in the settled regions of the province. Fishing attracts large numbers of international tourists who are drawn to world-class trout fisheries such as the Bow River and the Crowsnest River in southern Alberta.

For the most part, recreation is a relatively small user of water compared to all the other uses. Since it is a nonconsumptive use of water, the impacts to the aquatic environment are relatively low.



water management

The Government of Alberta owns all of the water in Alberta. While the biggest responsibility for water management falls on the provincial government, all three levels of government – municipal, provincial and federal – are involved in regulating the use of water and protecting our rivers and lakes.

Municipal

Municipalities engage in two primary activities that affect water: withdrawing water to provide drinking water, and discharging treated sewage. Some municipalities develop bylaws to help regulate how its residents can use the water. For example, during dry conditions, a municipality may order residents to reduce consumption by not watering lawns or washing vehicles. Municipalities are also responsible for operating and maintaining drinking water and wastewater treatment facilities to meet with provincial legislation.

The provincial government regulates how much water can be taken out of a water source, while maintaining a healthy ecosystem, and regulates how much and what can go back into a water source, while maintaining a healthy ecosystem.

Provincial

Since 1930, water management in Alberta has primarily been the responsibility of the provincial government. The Government of Alberta owns the rights to all water within its borders, and, through legislation, regulates all developments and activities that might impact rivers, lakes, wetlands and groundwater. In Alberta, the *Water Act* is used to manage and protect the quality of water and its distribution. To do this, regulators must ensure that industrial, commercial and public developments do not negatively impact aquatic ecosystems. This includes maintaining a suitable habitat for healthy populations of aquatic life. The *Environmental Protection and Enhancement Act* protects the aquatic environment by regulating point-source pollution from places like water treatment plants and refineries.

Federal

Federal laws also apply to Alberta's waterways. Canada's *Navigable Water Protection Act* ensures the protection of any waterway that is passable by any type of watercraft, whether it is a large boat or canoe. The federal *Fisheries Act* also has a role in managing fisheries in the province and developments that could affect fish habitat. The federal government is also responsible for the *Canadian Environmental Protection Act*, which provides protection from the release of toxic substances into rivers, streams and other water bodies. Some projects that affect water may be subject to an environmental assessment under the *Canadian Environmental Assessment Act*.

The Government of Alberta's role in the delivery of water

Albertans living adjacent to surface water have the statutory right to use that water for human consumption, sanitation, and other smaller household uses. The Government of Alberta protects this right and supports the delivery of water. Just as the Government of Alberta owns a highway, a provincial building, or a courthouse, it also owns $4.3 billion worth of infrastructure that is used to manage our water resources.

Apportionment agreements

The aquatic environment is not the only factor to consider when determining how much water Alberta can use from its rivers. Alberta has an agreement with Saskatchewan that guarantees a certain amount of water will flow across the border. Fifty per cent of the water in each of the shared, major river basins, must be allowed to flow into Saskatchewan. This agreement is called an apportionment agreement.

Alberta shares borders with British Columbia, Northwest Territories, Saskatchewan and Montana. Currently, apportionment agreements only exist with Saskatchewan and Montana.

The Carseland Weir southeast of Calgary, is owned and operated by the Government of Alberta. This structure diverts water from the Bow River mainly for irrigation. The diverted water is then under the control of various irrigation districts.

Apportionment agreements add another variable to the equation when determining how much water Alberta can use. Alberta Environment constantly monitors the levels and volumes of water within each of its major rivers. Decisions are made daily throughout the province as to how much water can be diverted from the river systems while meeting the needs of the aquatic environment, and of Saskatchewan and Montana.

Water allocation

When water is redirected for a use other than for domestic purposes, it is referred to as an allocation. Agricultural, industrial, municipal and other water users must apply to Alberta Environment for a license to divert and use a set allocation of water.

How much water can be allocated?

Before new water can be allocated, Alberta Environment considers:

- *Natural water supply:* The hydrological cycle determines the location and amount of water in this province at any one time. The amount of water in this province, whether it be in the ground, in the air, or on the surface, is always variable.
- *Needs of the environment:* Since all living things require water to live, some water is needed to maintain each ecosystem. While these specific amounts are not always known, it is certain the amount of water needed by an ecosystem varies from time to time.
- *Apportionment agreements:* Apportionment agreements add another variable to the equation when determining how much water Alberta can use.
- *Existing licenses:* New water allocations must not impact existing licenses.

The first step in deciding how much can be allocated is to determine the amount necessary for the aquatic environment, for apportionment agreements, and for existing water license holders. Once this amount is subtracted from the total amount available, the remainder can be used for supporting the economy and for human use. Depending on weather conditions, that amount is different each year.

Under current practices, once the available balance of water has been allocated to human use and economic development, a moratorium is placed on the river basin or groundwater aquifer and no further water is allocated. Certain basins in southern Alberta are nearing the limits of water allocation – particularly during dry periods when less water is flowing in the rivers.

First in time, first in right

In Alberta, we use the principle of "first in time, first in right." This principle, which has been in existence since 1894, means that water rights are prioritized according to how senior the license is, regardless of the use. The older the license, the higher that user is on the priority list.

The theory of the principle is that it protects an existing user's rights from those who come after them and is the best way to allow for orderly development.

Therefore, during a drought, a farmer with a senior license may have access to water for irrigation, while at the same time, a city with a more recently issued license may be forced to ask residents to ration water.

Many times, in situations such as these, Albertans have worked together to share water, a new feature allowed in the Alberta *Water Act*. Senior license holders will often transfer some of their water allocations so more junior license holders can still have some water.

While this co-operation has been the most desired method of dealing with water shortages, the *Water Act* does allow for a Legislative Order in times of emergency.

our time to act is now

While Alberta continues to see strong growth in its population and economy, demands for water will also rise. Determining the amount of water available 20 years from now is very difficult.

The Government of Alberta feels it is very important to give Albertans as much information as possible about water and its uses in the province. If you require further information about Alberta's water resource, please contact Alberta Environment's Information Centre at:

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Edmonton, Alberta T5K 2M6
Phone: 780-944-0313
(call toll-free by dialing 310-0000)
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